What is claimed is:

1. A method of performing rupture event scanning, comprising:

providing a transducer with an immobilized binding partner material and a sample material disposed thereon, where the sample material is applied to the immobilized binding partner material so that, if the sample material includes components having sufficient affinity for the immobilized binding partner material, bonds will form between at least some of such components and the immobilized binding partner material;

accelerating the transducer to induce bond breakage, where such accelerating is performed by applying a drive signal to the transducer, the drive signal including a waveform having multiple frequency components that are pre-selected based on expected resonance behavior of the transducer; and

analyzing an output response of the transducer in response to application of the drive signal.

2. The method of claim 1, where accelerating the transducer is performed by applying the drive signal to the transducer at successively increasing energy levels.

3. The method of claim 2, further comprising, for each of the energy levels, obtaining a corresponding output response of the transducer in response to application of the drive signal at such energy level.

4. The method of claim 2, where increasing from one of the energy levels to a successive one of the energy levels includes increasing an amplitude of the waveform.

5. The method of claim 2, where increasing from one of the energy levels to a successive one of the energy levels includes increasing a duration of the waveform.

6. The method of claim 2, where increasing from one of the energy levels to a successive one of the energy levels includes increasing an amplitude and a duration of the waveform.

7. The method of claim 1, where analyzing the output response of the transducer includes determining whether the output response exhibits amplitude phenomena indicating breakage of bonds formed between components of the sample material and the immobilized binding partner material.

8. The method of claim 7, where analyzing the output response of the transducer includes determining whether the output response exceeds an amplitude threshold.

9. The method of claim 7, where analyzing the output response of the transducer includes determining whether the output response exceeds an amplitude threshold at a given frequency or frequencies.

10. The method of claim 7, where if the output response exceeds the amplitude threshold, the method further includes determining whether the output response contains a known acoustic signature associated with breakage of a known bond.

11. The method of claim 10, where determining whether the output response contains a known acoustic signature associated with breakage of a known bond includes performing a frequency domain transformation on the output response of the transducer.

12. The method of claim 1, where analyzing the output response of the transducer includes determining whether the output response indicates a change in resonant frequency of the transducer.

13. The method of claim 12, where if the output response indicates a change in resonant frequency of the transducer, the method further includes determining whether the output response contains a known acoustic signature associated with breakage of a known bond.

14. The method of claim 13, where determining whether the output response contains a known acoustic signature associated with breakage of a known bond includes performing a frequency domain transformation on the output response of the transducer.

15. The method of claim 1, where analyzing the output response includes:

screening the output response for rupture indicators suggestive of a potential rupture event occurring between the immobilized binding partner material and the sample material; and

performing further processing on the output response only if the output response contains a rupture indicator, where such further processing includes determining whether the output response contains a known acoustic signature associated with a known bond.

16. The method of claim 15, where screening the output response for rupture indicators includes determining whether the output response exhibits amplitude phenomena indicating breakage of bonds formed between the sample material and the immobilized binding partner material.

17. The method of claim 16, where determining whether the output response exhibits amplitude phenomena includes determining whether the output response exceeds an amplitude threshold.

18. The method of claim 15, where screening the output response for rupture indicators includes determining whether the output response indicates a change in resonant frequency of the transducer.

19. The method of claim 1, further comprising applying an initialization drive signal to the transducer to cause an initial acceleration of the transducer and thereby facilitate formation of bonds between the sample material and the immobilized binding partner material.

20. A method of performing rupture event scanning, comprising:

providing a transducer with an immobilized binding partner material and a sample material disposed thereon;

mechanically exciting the transducer at different energy levels;

obtaining an output response of the transducer for each of the different energy levels;

screening each of the output responses for rupture indicators suggestive of a potential rupture event occurring between the immobilized binding partner material and the sample material; and

performing further processing on at least one of the output responses after said screening, where such further processing includes determining whether the output response contains a known acoustic signature associated with breakage of a known bond, and where such further processing is performed for the output response only if the output response contains a rupture indicator.

21. The method of claim 20, where screening each of the output responses for rupture indicators includes determining whether the output response exhibit amplitude phenomena indicating breakage of bonds formed between the immobilized binding partner material and the sample material.

22. The method of claim 21, where screening each of the output responses for rupture indicators includes determining whether the output response exceeds an amplitude threshold.

23. The method of claim 20, where screening each of the output responses for rupture indicators includes determining whether the output response indicates a change in resonant frequency of the transducer.

24. The method of claim 20, where mechanically exciting the transducer includes applying a drive signal to the transducer, the drive signal including a waveform having multiple frequency components that are pre-selected based on expected resonance behavior of the transducer.

25. A transducer-based sensor system for detecting whether a sample material contains a particular component, comprising:

a controller; and

a transducer operatively coupled with the controller, the transducer being configured to receive an immobilized binding partner material and the sample material on a surface of the transducer, where the sample material is brought into contact with the immobilized binding partner material so as to induce formation of a bond between the immobilized binding partner and the particular component, if the particular component is present within the sample material,

where the controller is configured to:

apply a drive signal to the transducer to mechanically excite the transducer and thereby potentially cause bond breakage, the drive signal including a waveform having multiple frequency components that are pre-selected based on expected resonance behavior of the transducer;

receive an output response of the transducer in response to application of the drive signal; and

analyze the output response to determine whether application of the drive signal induced bond breakage between the sample material and the immobilized binding partner material.

26. The system of claim 25, where the controller is configured to mechanically excite the transducer at different energy levels and obtain a corresponding output response for the transducer for each of the energy levels.

27. The system of claim 26, where the controller is configured to analyze the output responses for the energy levels by:

screening the output responses for rupture indicators suggestive of a potential rupture event occurring between the immobilized binding partner material and the sample material; and

performing further processing on at least one of the output responses after said screening, where such further processing includes determining whether the output response contains an acoustic signature known to be associated with the bond, and where such further processing is performed for the output response only if the output response contains a rupture indicator.

28. The system of claim 27, where the controller is configured to screen the output responses by determining whether any of the output responses exhibit amplitude phenomena indicating breakage of bonds formed between the sample material and the immobilized binding partner material.

29. The system of claim 28, where the controller is configured to determine whether any of the output responses exhibit the amplitude phenomena by determining whether any of the output responses exceed an amplitude threshold.

30. The system of claim 28, where the controller is configured to determine whether any of the output responses exhibit the amplitude phenomena by determining whether any of the output responses exceed an amplitude threshold at a filtered or selected range of frequencies.

31. The system of claim 27, where the controller is configured to screen the output responses by determining whether any of the output responses indicate a change in resonant frequency of the transducer.

32. The system of claim 25, where the controller is configured to mechanically excite the transducer at a plurality of successively increasing energy levels and obtain a corresponding output response for the transducer for each of the energy levels.

33. The system of claim 32, where, to increase from one of the energy levels to a successive one of the energy levels, the controller is configured to increase an amplitude of the waveform.

34. The system of claim 32, where, to increase from one of the energy levels to a successive one of the energy levels, the controller is configured to increase a duration of the waveform.

35. The system of claim 32, where, to increase from one of the energy levels to a successive one of the energy levels, the controller is configured to increase an amplitude and a duration of the waveform.

36. The system of claim 32, where the controller is configured to analyze the output responses for the energy levels by:

screening the output responses for rupture indicators suggestive of a potential rupture event occurring between the immobilized binding partner material and the sample material; and

performing further processing on at least one of the output responses after said screening, where such further processing includes determining whether the output response contains an acoustic signature known to be associated with the bond, and where such further processing is performed for the output response only if the output response contains a rupture indicator.

37. The system of claim 36, where the controller is configured to screen the output responses by determining whether any of the output responses exhibit amplitude phenomena indicating breakage of bonds formed between the sample material and the immobilized binding partner material.

38. The system of claim 37, where the controller is configured to determine whether any of the output responses exhibit the amplitude phenomena by determining whether any of the output responses exceed an amplitude threshold.

39. The system of claim 37, where the controller is configured to determine whether any of the output responses exhibit the amplitude phenomena by determining whether any of the output responses exceed an amplitude threshold at a filtered or selected range of frequencies.

40. The system of claim 36, where the controller is configured to screen the output responses by determining whether any of the output responses indicate a change in resonant frequency of the transducer.

41. A transducer-based sensor system for analyzing a sample material, comprising:

transducer means for receiving an immobilized binding partner material and the sample material, the sample material being placed into contact with the immobilized binding partner material;

drive signal means for mechanically exciting the transducer means, the drive signal means being configured to apply a drive signal to the transducer means, the drive signal including a waveform having multiple frequency components that are pre-selected based on expected resonance behavior of the transducer means; and

output processing means for determining whether predetermined bonds existed between the sample material and the immobilized binding partner material, where such determination is performed by processing an output response of the transducer means to determine whether such output response contains an acoustic signature associated with breakage of the predetermined bonds.